4WD-RCRA

MEMORANDUM

SUBJECT: Extent of Contamination and Scope of Investigations in the HSWA Program

FROM: Corrective Action Standing Team
Extent of Contamination Subteam

THROUGH: G. Alan Farmer, Chief /s/June 28, 1996
RCRA Branch

TO: RCRA Staff
FFB Staff

ISSUE

During implementation of the corrective action program covered by the 1984 Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA), the United States Environmental Protection Agency (EPA) - Region 4 has encountered numerous questions regarding the extent of contamination and the scope of investigations. Attached is final guidance developed by the EPA Region 4 Extent of Contamination Subteam of the Corrective Action Standing Team to address the above questions. Specifically, the guidance addresses the definition of extent of contamination and the question of what is the appropriate scope of investigations.

The guidance on the extent of contamination and the scope of investigations provides a definition of extent and then a general frame work in which to make decisions on the continuance or termination of an investigation. However, it is a site-specific decision to be made by the facility coordinator whether the investigations are adequate to make a decision regarding further action or not. This guidance was written to provide general guidelines for these issues. Each site may pose individual

questions, all of which cannot be answered in one guidance document. For these individual questions, the facility coordinator is encouraged to request guidance from the Corrective Action Standing Team, if necessary.

DISCLAIMER

This memo is intended to be a regional interpretation on the definition of extent of contamination and on how to determine whether further action is required during investigations. Nothing in this memo is intended to change or supersede future corrective action regulatory requirements. The proposed Subpart S rule is currently under review and a re-promulgation of the rule or a revision of the rule is due soon. If any provisions of the revisited Subpart S rule are in conflict with this guidance, then the final regulations will take precedent. The policies and procedures established in this document are intended solely for the guidance of employees of EPA. The policies and procedures are not intended and cannot be relied upon to create any rights, substantive or procedural, enforceable by any party in litigation with the United States. EPA reserves the right to act at variance with these policies and procedures and to change them at any time without public notice.

Attachment

cc: Jon Johnston, Federal Facilities Branch Chief

EPA Region 4
June 27, 1996

EXTENT OF CONTAMINATION AND SCOPE OF INVESTIGATIONS

Abstract

Discussions on the extent of contamination and the scope of Confirmatory Sampling (CS) or a RCRA Facility Investigation (RFI) have resulted in two basic questions: 1) what is the Regional interpretation of the term, "extent of contamination," and 2) when should investigations be terminated? The definition of "extent of contamination" requires a review of statutory and regulatory definitions, as well as past guidance and policy. The second question, on the other hand, presents a functional decision point in the corrective action process.

Extent of Contamination

The extent of contamination, as stated in the Regional model Hazardous and Solid Waste Amendments (HSWA) portion of the RCRA permit, is defined as the horizontal and vertical area within which the concentrations of hazardous constituents in the environmental media being investigated are above detection limits or background concentrations indicative of the region, whichever is appropriate as determined by the Regional Administrator. This definition is based upon the general objective of a RCRA Facility Investigation (RFI) and the definition of release. The general objective of an RFI is to characterize the nature, extent, direction, rate, movement and concentrations of releases. A release is defined as a detection of a hazardous constituent above background. Additionally, this interpretation of extent of contamination has been upheld during permit appeals, where the Administrator stated that "...the RFI Report is to describe contamination at the facility, descriptions that will then be used by the Region to decide whether corrective action is necessary under the relevant statutory and regulatory standards. It is perfectly consistent with the statute to require a permittee to identify contamination based on background levels, leaving it to the Region then to specify the releases that require cleanup to protect human health and the environment." (Hoechst Celanese Corporation RCRA Permit No. SCD 097631691, RCRA Appeal No. 87-13, February 28, 1989).

Background is generally defined as a sample from an undisturbed region similar to the media of concern. For example, the geology of the background soil sample and the soil in the vicinity of concern should be similar. These samples are collected from an area, water body or site similar to the one under investigation, but located in an area known or thought to be free from pollutants of concern. Another type of sample that is often collected and confused with the background is actually a control sample. A control sample, or for groundwater this is also known as an upgradient sample, is a sample collected upstream or upgradient from a source or site to isolate the effects of the source or site on the media of concern, in other words from a similar strata etc. as the medium of concern from an area that is not affected by a particular unit or facility, as opposed to a sample from an area that is not disturbed. Though a background sample

is generally preferred over a control sample, professional judgement should be used on the appropriateness of using control samples for defining “site-specific background,” as background samples are often difficult to obtain in industrial settings.

Background samples are collected to determine site-specific ranges of concentrations for naturally occurring constituents, *e.g.*, inorganic constituents. “Background” for non-naturally occurring constituents (*e.g.*, most organic constituents) is generally considered to be below the detection limit. However, proposed background samples are usually analyzed for both inorganic and organic constituents to 1) determine background concentrations for inorganic constituents and 2) verify the area being sampled is actually undisturbed by facility operations (*i.e.*, organic constituents are not detected).

Although the term background is well defined, the actual definition of "above background" as used in a release determination is, can be, or often may be unclear when naturally occurring constituents have been detected. Thus, several definitions of a release based on a comparison to background have been developed by EPA. The definitions and the programs that uses this definition are listed below:

A. Groundwater Technology Support Unit/Office of Health Assessment Hydrogeology Support Team (rule of thumb): A release has occurred if the concentration is greater than two times the average background concentration. This average concentration includes any non-detects (*i.e.*, less than the practical quantitation limit [PQL]) evaluated at half the detection limit. This rule of thumb is preferred over a full statistical analysis in which background is defined as the average background concentration plus three times the standard deviation. This rule of thumb should result in roughly the same decision as the full statistical analysis.

B. 40 CFR Part 300 Appendix A: If a constituent is not detected in the background samples (*i.e.*, less than method detection limit [MDL]), a release has occurred if the constituent is detected from a sample at the unit of concern. If the constituent is detected in the background samples, a release has occurred if the concentration from samples at the unit of concern is greater than three times the average background concentration.

   This is the definition used by site assessment for ranking sites on the NPL. This definition is usually used for metals, not organics. However, in evaluating analytical data on inorganics during remedial investigations, two times background is still often the rule of thumb in Superfund.

C. Office of Health Assessment: A release has occurred if the concentration is greater than two times the average background concentration. This average concentration does not

include any non-detects, if possible. If only non-detect background concentrations, then background is considered below the detection limit.

D. 40 CFR 264.97: For groundwater, analytical data is evaluated based upon a statistically significant increase over background.

Though the choice of which definition to use is based on professional judgement, it is recommended that two times the detected concentrations in background samples, as discussed in Option A, be used in HSWA corrective action Region 4 to define a release, at least for initial evaluations. However, professional judgement should be exercised for constituents detected at concentrations between two to three times the detected background concentrations. For groundwater the two to three times rule might not apply if two or three times the background concentration is greater than the MCL or equivalent health-based concentration. In this case, the MCL or equivalent health-based concentration should be used for comparison of whether or not a release has occurred.

Investigation Continuation/Termination

From a practical standpoint, when do we terminate investigations and move on to a comprehensive RFI, for the case of CS; to a no further action decision; or to a Corrective Measures Study (CMS)? To answer this question, the purpose of the specific investigation must be considered. Figure 1 shows a flowchart of a portion the corrective action process, including confirmatory sampling. For the purposes of this discussion, the focus is on the decision points of the CS/Phase I RFI and the RFI.

Confirmatory Sampling/Phase I RCRA Facility Investigation

CS, or a Phase I RFI, is generally conducted to confirm the presence or absence of a release. The decision end points are usually either no further action or further investigation under the RFI (Figure 1, Decision Point 1). These sampling events are often limited in scope. As discussed above, a release is defined as the detection of a hazardous constituent above background. If contamination is not detected, or detected below background, then a no further action decision is made for the solid waste management unit (SWMU) or area of concern (AOC), and all investigations are considered complete for that particular SWMU or AOC at that time. Detection above *background or detection limits* (see discussion above), however, confirms the presence of contamination. Generally, it is then recommended that the investigation proceed to a comprehensive RFI. However, if the approved CS Work Plan requires more extensive sampling, such that the objective has gone beyond verifying a release, the decision-making process may follow more closely that of an RFI and make use of professional judgement.

RCRA Facility Investigation

For an RFI, the general objective is to delineate the nature and extent of contamination at a SWMU, AOC or study area. The decision endpoints are no further action, further investigation or requiring a CMS. As seen from Figure 1, the questions that arise during an RFI are two-fold. First, is the nature and extent delineated, and second, does the contamination present a threat to human health and the environment?

Nature and Extent: The first question during an RFI addresses whether the nature and extent of contamination is characterized (Figure 1, Decision Point 2). If not, additional sampling is required. The determination of this delineation is based on professional judgement. Following the strict definition of extent of contamination, the RFI may proceed until the contamination is defined to background. Besides fulfilling the general objective of the RFI, this allows pathways of exposure (including continuing groundwater contamination) other than via ingestion in residential scenarios as quantitatively outlined in the proposed rule for Corrective Action for Solid Waste Management Units at Hazardous Waste Facilities (proposed Subpart S rule) (FR, Vol. 55, July 27, 1990) to be addressed adequately. However, this is potentially contrary to the guidance in the preamble to the proposed Subpart S rule, which states:

> Facility investigations and other analyses will be streamlined to focus on plausible concerns and likely remedies, and to expedite cleanup decisions. While remedial investigations must be thorough enough to identify any serious problems, EPA recognizes that its own resources and those of the regulated industry are finite, and therefore that these investigations must be focused on plausible concerns and conducted in a step-wise fashion, with early screens to determine whether further investigations are necessary.

and,

> In defining the nature and scope of remedial investigations at RCRA facilities, EPA will endeavor to minimize unnecessary and unproductive investigations, and to focus resources on characterizing actual environmental problems at the facility.

Professional judgement must be exercised in pursuing the scope of investigation at a given facility and a given unit. Often with an RFI, the sampling plan has been developed to provide adequate information such that the delineation of the nature and extent of contamination may be determined based on concentrations other than background, such as action or screening levels. In such cases a general pattern of contamination has been determined, and the nature and extent is adequately delineated in the facility coordinator's judgement to terminate the investigation based on comparison to some type of action or screening levels. Additionally, focused investigations are sometimes conducted to determine if there are and to characterize any

"hot spots" at the facility. In these cases, limiting the investigation to action or screening levels is appropriate.

RCRA Corrective Action Process

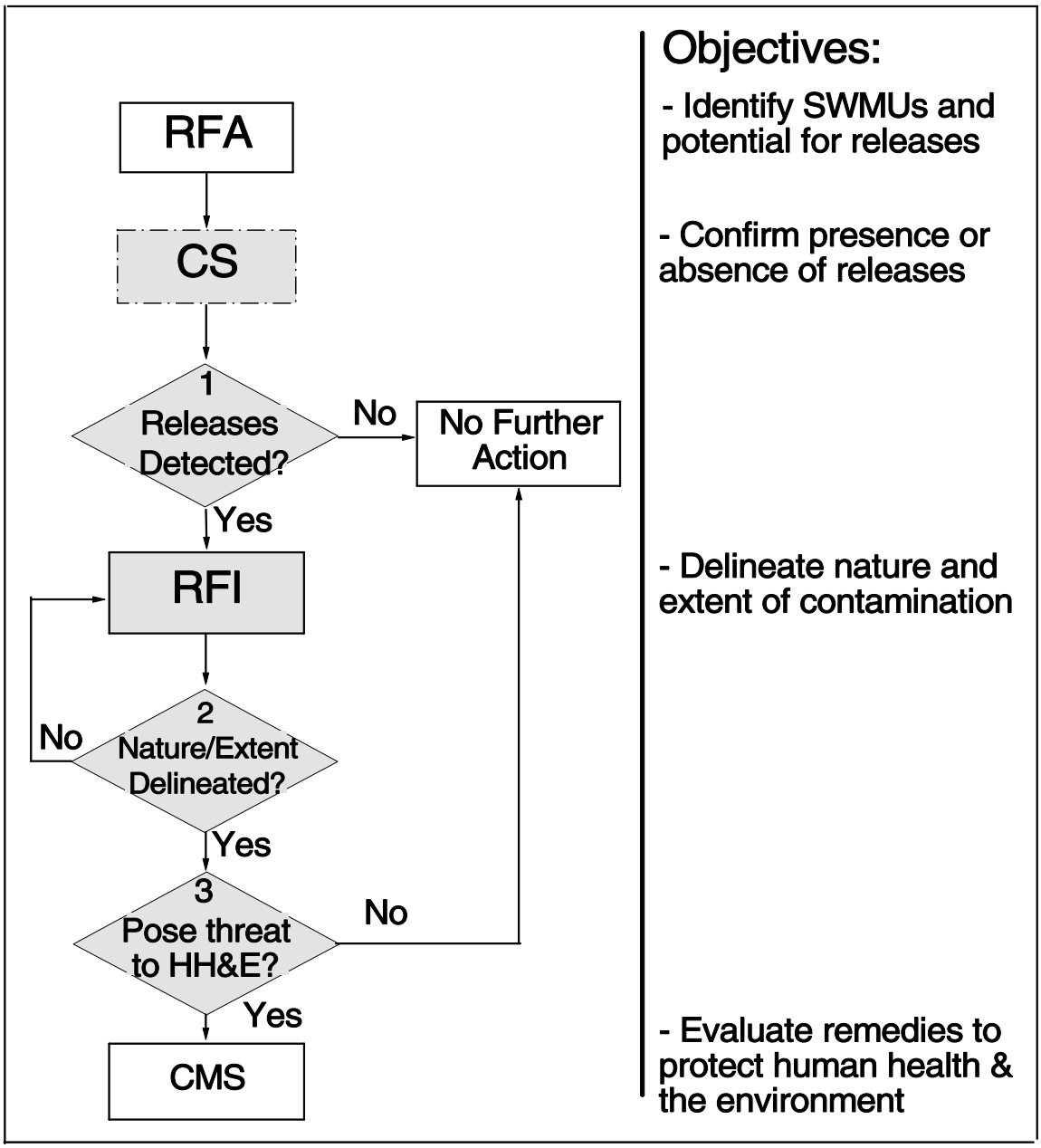

Figure 1

Protective of Human Health and the Environment: The second question that arises during the RFI is, "Does the existing contamination, if present, pose a threat to human health and the environment?" (Figure 1, Decision Point 3) This question is asked to determine whether a CMS is necessary and involves comparison to action or screening levels. The term "action levels" has come to be associated with health-based concentrations based on exposure via ingestion in a residential scenario, as outlined in the proposed Subpart S rule. However, as discussed in the preamble to the proposed Subpart S rule, action levels or, using the CERCLA term, screening levels should address each pathway of concern and the presence of multiple contaminants. It may also be appropriate to establish levels used for answering the above question based on scenarios other that residential, provided the land use allows it and deed notifications and institutional controls are in place or to be initiated. Such a decision is a risk management decision and includes qualitative risk analysis. More specific guidance on using risk analysis in determining appropriate health-based concentrations is outlined in the memorandum from the Risk Assessment Subteam of the Corrective Action Standing Team (CAST) entitled, "Risk Assessments Within the HSWA Program," which is presently undergoing internal review and signature (draft date 5/31/96).

Suggested Guidance

Some suggested guidelines on the evaluation of analytical data and subsequent conclusions from the CS or the RFI are as follows:

- With limited sampling, as is usually the case for CS or Phase I RFIs, the analytical data should in general be compared to background. This is because the objective of a CS or Phase I RFI is to confirm the presence or absence of releases, *i.e.*, concentrations greater than background. It is often difficult to obtain an objective assurance when a release has been detected in this scenario that the area of greatest contamination was sampled at the SWMU or AOC. However, the CS/Phase I RFI data may aid to limit further analyses (*e.g.*, eliminate families of chemicals) and focus further sampling. Additionally, the CS should be conducted and the data evaluated taking into consideration the potential pathways to both human and ecological receptors. That way decisions to proceed or not will include these considerations and future investigation may be focused to address these pathways. Data collection in one phase should be done in a manner that allows the data to be useful in subsequent phases.

- When sufficient sampling has provided a "pattern" of contamination and assurance that the area of highest levels of contamination have been identified at a particular SWMU or AOC, the scope of the RFI, or CS/Phase I RFI in cases where the objective of such an investigation goes beyond confirming the presence of a release, may be limited based on comparison to action/screening levels. This should not necessarily result in any undetected contamination at that SWMU or AOC. However, even in these

instances, the definition of action/screening levels needs to consider multiple constituents and other pathways of concern, such as leaching to groundwater. EPA Region 4 Office of Health Assessment has developed supplemental guidance on risk assessment that addresses some of these concerns in discussions on the selection of chemicals of potential concern (COPCs). Further details on the use of these guidances from the Office of Health Assessment are discussed in the "Risk Assessments Within the HSWA Program" memorandum.

- When contamination is limited to on-site, localized "hot spots," or the objective of the investigation is to delineate the areas of highest contamination, analytical results may be compared to action/screening levels. A comparison of the hot spot data to action levels is, in the strictest sense, not limiting the investigation to action levels, because the highest levels of contamination and extent are known. This is probably particularly applicable if pursuing interim measures (IMs) or concurrent, focused CMSs.

As pointed out, these decisions are site-specific and rely heavily on professional judgement. With this in mind the decisions made on when to terminate the CS or RFI to move forward with a no further action decision, a CMS or an IM must be well documented to the file.

Conclusions

Discussions on the extent of contamination and the scope of Confirmatory Sampling (CS) or a RCRA Facility Investigation (RFI) have resulted in two basic questions: 1) what is the Regional interpretation of the term, "extent of contamination," and 2) when should investigations be terminated? When investigating releases of hazardous constituents from SWMUs or AOCs, the extent of contamination is defined as the horizontal and vertical area within which the concentrations of hazardous constituents in the environmental media being investigated are above detection limits or background concentrations indicative of the region, whichever is appropriate as determined by the Regional Administrator. This definition is based upon the general objective of a RCRA Facility Investigation (RFI) and the definition of release. However, the point at which to terminate or continue investigations can often rely significantly on professional judgement with a clear understanding of the objective of the investigation in question.

Redevelopment of Subpart S

Several aspects of proposed Subpart S are currently undergoing evaluation for the re-proposal of the rule. This evaluation includes, among other things, examining land use issues, the use of risk assessments (including ecological risk assessments), and the use and definition of action levels. As more information is gathered and examined during these evaluations, the strategy outlined above might necessarily change. As with many aspects of corrective action

under HSWA, this strategy will continue to be evaluated and revised to assure adherence to any new guidance or policy that results from the evaluation of the proposed Subpart S rule.